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CONTACT LENSES*

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Introduction

It would seem that any device that might be used to improve visual acuity would well be within the sphere of the refractionist. Particularly would this be true of cases where the visual acuity was exceedingly low, as in Kerataconus, and by a simple mechanical device, almost miraculous improvements were possible.

Like other devices of this nature, refractionists in this country, have been prone to neglect their possibilities, due probably to the lack of a complete exposition of the principles involved, the actual techniques, etc. It was the appearance of several cases of Kerataconus at the New York Optometric Society Clinic, that prompted these investigations. The results of these investigations are here indicated.

Since not even a complete elementary exposition of the subject has as yet appeared in English, this paper will deal with the subject as completely as possible. A thorough analysis of the optical theory involved in the use of these lenses both in the correction of Kerataconous, and the correction of ordinary ametropic errors, will be attempted. The notations used in the optical systems described follow those laid down by Professor James P. C. Southall.

Scope of Paper

1. The general problem of contact lenses.
2. Types of contact lenses.
3. Optical principles of the contact lens.
4. Technique of adapting contact lenses to the eye and securing tolerance.
5. Case reports.

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The General Problem of Contact Lenses

Contact lenses came into being as the result of investigations in the correction of Kerataconus. In this condition, optically at least, the cornea assumes the form of a hyperbola of conical shape. First attempts at correction consisted in the grinding of proper hyperbolic lenses, to be worn as spectacles. Rahlmann, in 1879, was probably the first to suggest these. These were in general of some success as long as the optic axis of symmetry of the cornea coincided with the optic axis of the lens. The slightest displacement of these two axes, as the eye rotated, caused considerable distortion with resulting loss of acuity. It was then that contact lenses were tried. The thought behind the use of these lenses was that all of the astigmatism produced by the Kerataconus would be neutralized by a solution held in place by the contact lens, and in place of the highly astigmatic irregular cornea, there would be substituted the spherical curve of the contact lens.

At first these lenses were of the blown glass type. Fick, in 1888, first introduced these lenses for the correction of Kerataconus. Sulzer, working on the same problem, made some improvements on their construction. These lenses, though, were designed to rest on the outer edge of the cornea, and in general could be worn for just a few minutes. The marked improvement in acuity that did result, led to further experimentation.

Mueller's contribution to the problem was in adding a scleral flange, so that the corneal part would not touch the cornea. This lens was also of the blown glass type, and could not be controlled with sufficient precision. It was necessary to try a number of glasses before a suitable one could be selected, and then this lens could not be duplicated if it was so desired. All attempts at grinding these lenses so far had been unsuccessful. Several men had used these blown glasses with marked success in a number of cases. In 1920, ground contact lenses were first demonstrated by Stock. These were made by Carl Zeiss of Jena, Germany. The present lenses for the correction of Kerataconus are quite similar to those shown at first. They consist of a scleral part, whose rim or edge rests on the sclera, and a corneal part so attached to this scleral part, as to successfully avoid touching the cornea at any point. Deutsch reports the successful use of these lenses in the correction of irregular astigmatism and high ametropia. These ground contact lenses were then made with refracting power from +6.00D. to —6.00 D. and thus in many cases spectacles could be dispensed with entirely.

It was the marked invisibility of these contact lenses that first led to the suggestions of using these lenses for the correction of ametropias. There can be no doubt but that the use of contact lenses for correction of ordinary ametropias would be of decided advantages in special cases. Consider for example, those cases of actors, actresses, singers, artists, waiters, swimmers, etc. Many of these people find it impossible to pursue their vocation if their vision is poor without their glasses.

Consider further the optical aberrations and distortions resulting from the use of cataract lenses, high myopic or hyperopic glasses, or high astigmatic lenses. The use of the contact lens in these cases would besides producing practically total invisibility, give a much wider field of vision, do away with the aberration of astigmatism of oblique incidence, and all other disadvantages resulting from a rotating eye behind a fixed spectacle lens. As will be shown later, and in the presentation of the optical principles, a much better acuity can be obtained in certain cases as compared to the use of spectacle lenses.

All of the above theoretical advantages become practical only when these lenses can be worn comfortably, without any after effects, and can be handled easily and quickly by the patients themselves. Unless a proper degree of tolerance to these lenses can be obtained, it would be unwise and impractical to prescribe contact lenses for the correction of Kerataconus, or ordinary ametropias.

To properly understand the problem of contact lenses, it is necessary thoroughly to understand,

(1) The optical changes that occur when such a lens is used in contradistinction to a spectacle lens, and

(2) The necessity and method of obtaining tolerance in the use of these lenses.

Types of Contact Lenses

At present, contact lenses* are ground from hard, chemical resisting optical glass. They are ground to form two spherical parts, a corneal part K, and a scleral part S (fig. 1, p. 81).

These lenses are now made for two general purposes, one, the correction of conical cornea, and two, the correction of errors of refraction. Optically these may be used interchangeably. Practically however, there are important differences. Those made for the correction of conical cornea are each made with the diameter of K=12 mm. and the diameter of S = 20 mm. The variable factor is the radius $r_{1K}=r_{2K}$ These, of course, determine the refraction of the contact lens. The radii are made in $r_1k=r_2k=6.5$ mm., 7.1 mm., 8.1 mm., and 9.0 mm. Figure 2 indicates diagramatically the different sagitta of the corneal parts of these lenses.

The scleral radii of these lenses are all made of $r_{1S}=r_{2S}=12$ mm. In actual use in Kerataconus cases, that one of these four lenses is selected which will clear the vertex of the cornea, and alter the refraction least. Evidently, when the lens is inserted under the lid, the scleral rim or edge will come to rest at that point on the sclera where the horizontal diameter of the sclera is 20 mm. Hence, the distance from this point of contact on the sclera, to the vertex of the cornea must be no greater than 3.76 mm.+2.3 mm., if lens Nr90 is to be used, and no greater than 3.76+2.6 mm. for lens Nr81, and 3.76 mm.+3.3 mm. for lens

*Two special sight correcting appliances. V. M. E. Koch, 1929 Year Book of the New York State Optometric Association.

Wm. Feinbloom. Plate 1. Subject with Contact Lens in one eye. Note the invisibility.

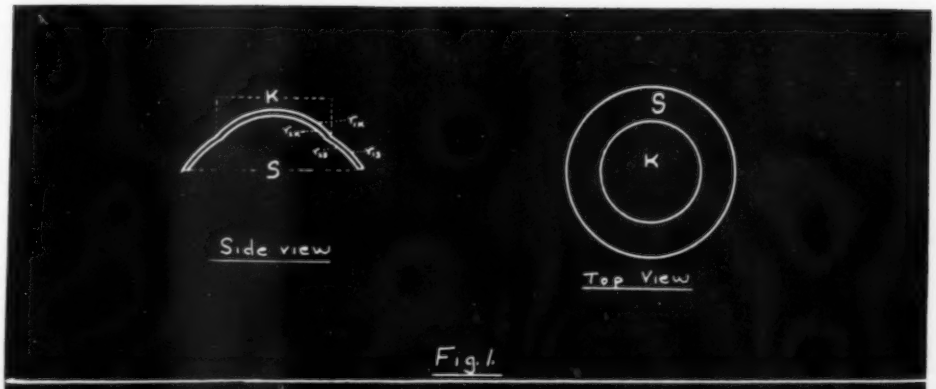


Fig. 1.

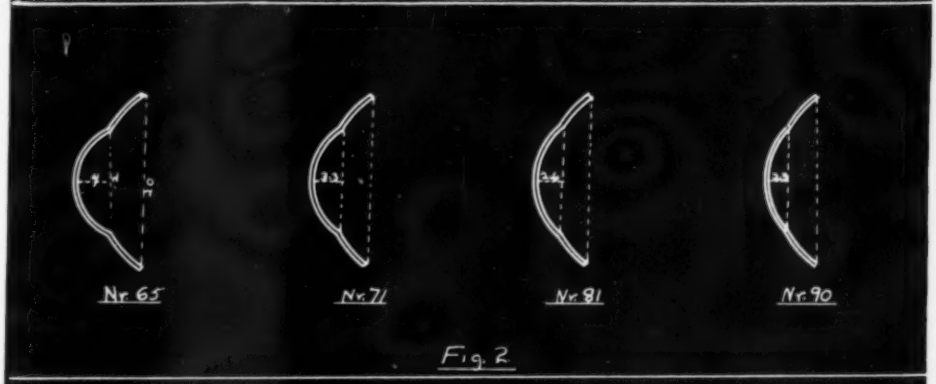
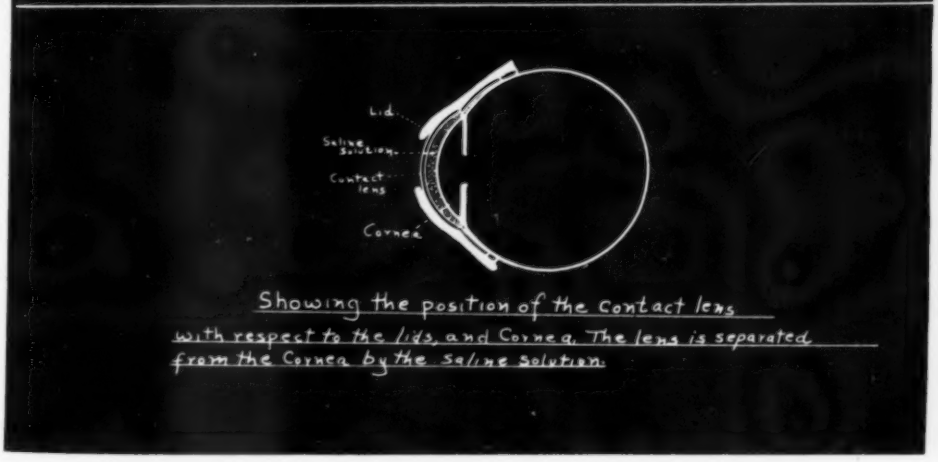


Fig. 2.



Showing the position of the contact lens with respect to the lids, and Cornea. The lens is separated from the Cornea by the saline solution.

Nr71, and 3.76+4.0 mm. for lens Nr65. Here 3.76 mm. is the distance between the scleral rim and corneal rim. To actually measure these distances on the human eye with any precision is at present quite difficult. It is only by trying one lens and observing how its fits the eyeball that one can judge which is the most suitable lens. After some experience, it is a simple matter to determine by inspection, which of these four lenses are most suitable for a given case. These lenses are supplied by order numbers with the following specifications (Table 1, p. 161.

When these lenses are inserted, in cases of conical cornea, they will effectively neutralize all of the irregular and regular astigmatism of the cornea. In very high amounts of astigmatism, over 10 D. or in cases of lenticular astigmatism, some residual amount of astigmatism will remain that will have to be corrected with the usual lens correction. Hence, after inserting the lens, refract the eye in the usual way, objectively and subjectively, and determine what sphere will be necessary to produce best vision. If this sphere is between +6.00 D. S., and — 6.00 D. S., it may be incorporated by actual grinding, in the contact lens. The actual number of lenses suitable for Kerataconus, is therefore increased manifold. In adding this refracting power to the contact lens, the inner radius, r_{2K} remains as before, but the outer radius r_{1K} is altered to incorporate the necessary refracting power. In these cases then $r_{1K} \pm r_{2K}$. In ordering such refracting power in combination with the contact lens, it must be remembered that the usual spectacle correction lens is 12 mm. anterior to the vertex of the cornea, and a suitable allowance should be made for its change in position, for the contact lens is now optically in contact with the cornea. From Table 1, it appears that one might select Nr65 ⊃ refraction — 4.50 D. S., or Nr71 and use them interchangeably. In one case, depending upon the degree of conical formation, it might be better to select the first of these lenses, in another, the second.

The possibility of using these lenses to correct ametropias, led to the construction of another series of contact lenses. In principle, these lenses act precisely as those discussed above. By changing the corneal curvature it is possible to alter the refraction of the eye. To perform this over a wide range of refraction, 39 lenses of the following specifications are now made (Table 2, p. 84).

The essential differences between these contact lenses and those used as Kerataconus contact lenses are

(1) There are three scleral curves instead of one.

(2) There are a greater variety of corneal curves.

In order to permit these differences to exist, it is necessary at times to vary the diameter of the corneal section K to less than 12 mm., and S to less than 20 mm. This means of course that the depth of the sagitta of the corneal part will differ considerably from that of the Kerataconus lenses.

Each of these 39 lenses are of plano refracting power. They may

Table 1.

Order Number	Radius r_{LN}	Scleral Radius r_{LS}	Sagitta	h	Diameter of Corneal Section	Diameter of Scleral Section	$F = \frac{.1336 - 1}{r_{LN}}$
Nr. 65	6.5 mm	12.0 mm	4.0 mm	3.76 mm	12 mm	20 mm	51.69 D.
Nr. 71	7.1 mm	12.0	3.3	3.76	12	20	47.32
Nr. 81	8.2	12.0	2.6	3.76	12	20	40.97
Nr. 90	9.0	12.0	2 3	3.76	12	20	34.33

Table 2

Order Number	Corneal Radius r_{LN}	Scleral Radius r_{LS}		Order Number	Corneal Radius r_{LN}	Scleral Radius r_{LS}
1/5	5.0 mm	11 mm		1/85	8.5 mm	11
2/5	5.0	12		2/85	8.5	12
3/5	5.0	13		3/85	8.5	13
1/55	5.5	11		1/9	9.0	11
2/55	5.5	12		2/9	9.0	12
3/55	5.5	13		3/9	9.0	13
1/6	6.0	11		1/95	9.5	11
2/6	6.0	12		2/95	9.5	12
3/6	6.0	13		3/95	9.5	13
1/65	6.5	11		1/0	10.0	11
2/65	6.5	12		2/0	10.0	12
3/65	6.5	13		3/0	10.0	13
1/7	7.0	11		1/05	10.5	11
2/7	7.0	12		2/05	10.5	12
3/7	7.0	13		3/05	10.5	13
1/75	7.5	11		1/1	11.0	11
2/75	7.5	12		2/1	11.0	12
3/75	7.5	13		3/1	11.0	13
1/8	8.0	11				
2/8	8.0	12				
3/8	8.0	13				

each be obtained with refracting powers varying from + 6.00 D. to — 6.00 D. Thus, as will be shown later, it is possible to correct almost any degree or type of ametropia. The purpose of having three scleral curves instead of one is to permit more satisfactory fitting of the scleral margin or rim.

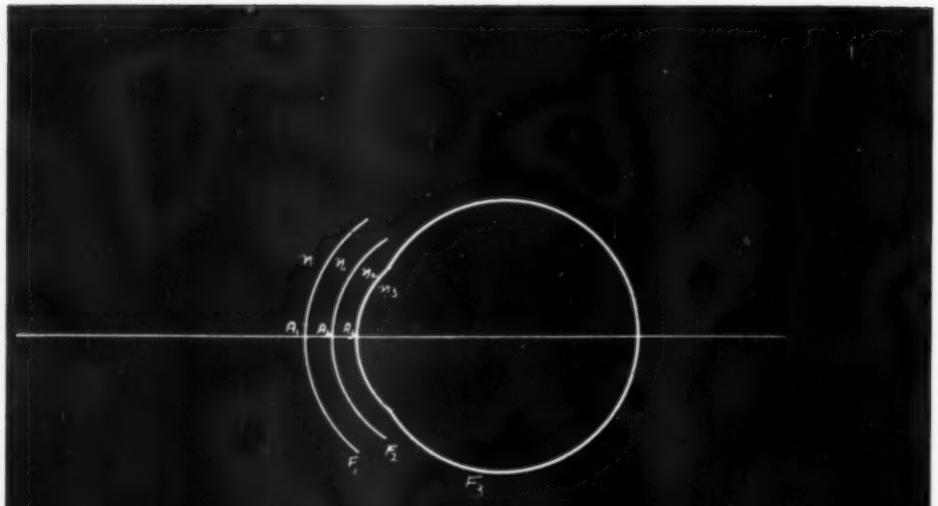


Fig. 3

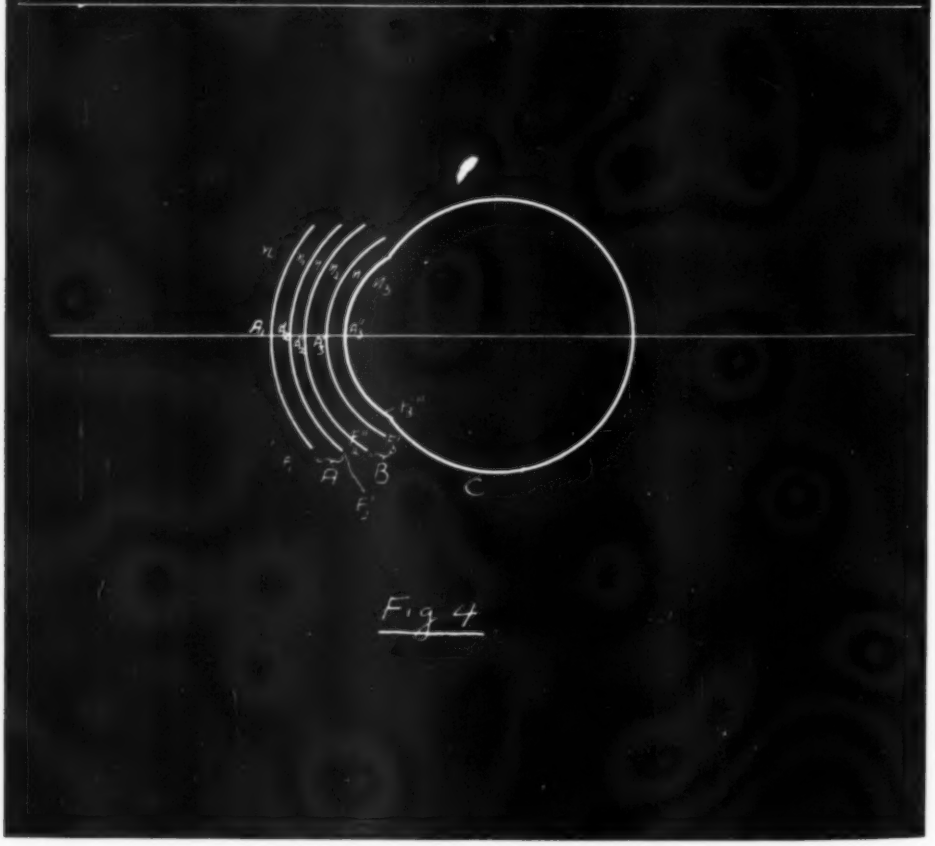


Fig 4

Let the contact lens be separated from the saline solution by an infinitely thin layer of air, and the saline solution from the cornea by

In Figure 3, let A_1, A_2, A_3 represent the vertices of the anterior surface of the contact lens, the posterior surface of the contact lens, and the anterior surface of the cornea, respectively.

Let $n = 1$ = index of air

$n_1 = 1.516$ = index of glass of contact lens
$n_2 = 1.336$ = index of saline solution
$n_3 = 1.376$ = index of cornea
$n_4 = 1.336$ = index of aqueous and vitreous

Let $A_1\ A_2 = d_1 = 0.5$ mm. thickness of contact lens
$A_2\ A_3 = d_2$ = distance between vertex of posterior surface of contact lens and anterior surface of cornea
F_1 = refracting power of anterior surface of contact lens
F_2 = refracting power of posterior surface of contact lens
F_3 = refracting power of the eye

In order that the contact lens be a correction lens, i. e., properly correct the ametropia, it is necessary that the system F_{123} be of such an order that its second focal point fall on the retina.

Evidently with the interposition of the contact lens as a correction lens, the entire optical system of the eye is changed. In order to simplify the investigation of the changes that do occur, the following method is adopted:

The Optical Principles of the Contact Lens

an infinitely thin layer of air. (Fig. 4). We now have three systems. A, the contact lens surrounded by air, B, the liquid lens of saline solution surrounded by air, and C, the eye in air.

The refracting power of A is given by

$$F_A = F_1 + F'_2 - \frac{d_1}{n_1}(F_1\ F'_2)$$

$$= \frac{n_1 - 1}{r_1} + \frac{1 - n_1}{r_2} - \frac{d_1}{n_1}\left(\frac{n_1 - 1}{r_1}\right)\left(\frac{1 - n_1}{r_2}\right)$$

$$(1)\quad F_A = \frac{(n_1 - 1)\left[r_2 - r_1 + \left(1 - \frac{1}{n_1}\right) d_1\right]}{r_1\ r_2}$$

The position of the principal points of system A are

$$(2)\quad A_1\ H_A = \frac{d_1}{n_1}\frac{F_2{}^1}{F_A} \text{ and } A^1{}_2\ H^1{}_A = -\frac{d_1}{n_1}\frac{F_1}{F_A}$$

if equation (1) is set equal to zero, *i.e.*, the contact lens is of zero power, then

$$0 = \frac{(n_1 - 1)\ [\, r_2 - r_1 + (1 - \frac{1}{n_1})\, d_1\,]}{r_1 \quad r_2}$$

and substituting the values for n_1 and d_1 then

(3) $r_1 = r_2 + 0.1702$ mm. which indicates that for plano contact lenses r_1 really differs from r_2 by 0.1702 mm.

Considering system B,

$$F_B = F_2'' + F_3^1 - \frac{d_2}{n_2} F_2^{11} F_3^1$$

$$(4)\ \therefore F_B = \frac{(n_2 - 1)\ [\, r_3 - r_2 + (1 - \frac{1}{n_2})\, d_2\,]}{r_2 \quad r_3}$$

and the position of the principal points will be

$$(5)\ A_2^{11} H_B = \frac{d_2}{n_2} \frac{F_3^1}{F_B} \text{ and } A_3^1 H'_B = \frac{d_2}{n_2} \frac{F_2^{11}}{F_B}$$

Considering system C, the eye,
Accepting Gullstrand's constants for the schematic eye, then
$F_C = 58.64$ D.

$A_3^{11} H_C = 1.348$ mm. in air
$A_3^{11} H_C^1 = 1.602$ mm. in vitreous humor

If systems A, B and C are now combined, the position of the resulting principal points may be determined as follows:

Let d_3 be the distance between the second principal point of system B, and first principal point of system C. Then,

$$(6)\ d_3 = H'_B H_C = H'_B A_3^1 + A_3^{11} H_C$$

$$= 0.001348 \text{ m.} + \frac{d_2}{n_2} \frac{F_2^{11}}{F_B}$$

Therefore

(7) $F_{123} = F_{ABC} = F_{BC} = F_B + F_C - D_3 F_B F_C$ and

$$(8)\quad H_B\ H_{ABC} = \frac{d_3\ Fc}{F_{ABC}} \text{ and } H'_C\ H'_{ABC} = -\frac{d_3\ n_4\ F_B}{F_{ABC}}$$

where n_4 = index of vitreous = 1.336. To refer the position of these first (H_{ABC}), and second (H'_{ABC}) principal points of the combined system (F_{ABC}) to the anterior surface of the cornea, so that they may be compared to their normal position,

$$(9)\quad A_3\ H_{123} = A_3\ A_2 + A_2\ H_B + H_B\ H_{123}$$
$$= -\ d_2 + A_2\ H_B + H_B\ H_{123}$$

Similarly

$$(10)\quad A_3\ H^1_{123} = A_3\ H_C{}^1 + H^1{}_C\ H_{123}$$

for it is evident from our original supposition concerning the interposition of an infinitely thin layer of air, that the points A_2, $A_2{}^1$ and $A_2{}^{11}$ are identical, as are also the points A_3, $A_3{}^1$ and $A_3{}^{11}$.

The distance $d_2 = A_2\ A_3 \doteq 0.5$ mm. Actually this distance may vary from 0.00 mm. to 1.00 mm. The possible variation of d from 0.5 mm. would make practically no change in the calculations.

In order to observe the changes that occur in the position of the principal points and focal points in cases of corrected ametropia when contact lenses are used instead of ordinary spectacle lenses, the following computations have been made: In table 3 (p. 89).

A^1 = Static ametropia of the eye.

F_D = Refraction of correction spectacle lens placed 12 mm. in front of the eye.

Fc = Refracting power of the eye = 58.64 D.

F_{DC} = Refracting power of spectacle lens combined with the eye.

$H'_D\ H_{DC}$ = Distance of first principal point of combined system from second principal point of correction lens.

$H_C\ H'_{DC}$ = Distance of second principal point of combined system from first principal point of eye.

F_{DC} = Primary focal length of system 1 and 2.

F'_{DC} = Secondary focal length of system 1 and 2.

The determination of these various unknowns may be arrived at in the usual way from the following equations:

$$(a)\quad F_D = \frac{A^1}{1 + d_4\ A^1}$$

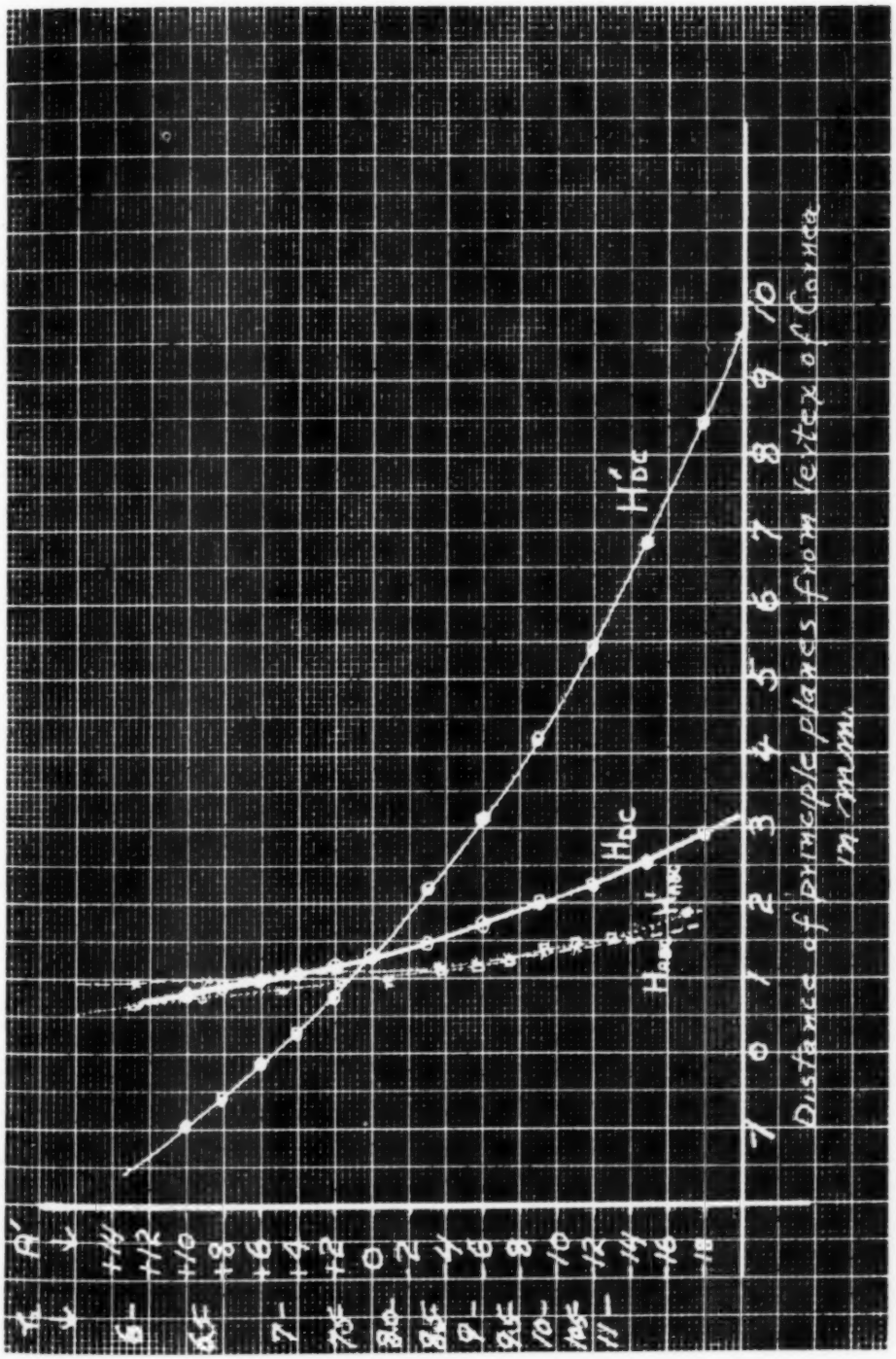
$$(b)\quad F_{DC} = F_D + F_C - d_4\ F_D\ F_C$$
$$= F_D + 58.64 - .012\ (58.64)\ F_D$$

$$(c)\quad H'_D\ H_{DC} = \frac{d_4\ F_D}{F_{DC}} = \frac{.012\ (58.64)}{F_{DC}}$$

Table 3 and 5

A'	F_o	F_{oc}	$H'_D H_{oc}$	$H_c H'_{oc}$	
+10	+8.93	+61.37	+11.46	-2.33	
+8	+7.29	+60.83	+11.56	-1.92	
+6	+5.59	+60.32	+11.66	-1.48	
+4	+3.81	+59.79	+11.77	-1.02	
+2	+1.95	+59.23	+11.88	-0.53	
0	0	+58.64	+12.00	0.00	
-3	-3.11	+57.74	+12.19	+0.87	
-6	-6.44	+56.71	+12.41	+1.82	
-9	-9.98	+55.65	+12.70	+2.87	
-12	-14.02	+54.43	+12.93	+4.10	
-15	-18.29	+53.15	+13.24	+5.51	
-18	-23.05	+51.73	+13.60	+7.11	
-20	-26.32	+50.73	+13.87	+8.31	

A'	f_{oc}	f'_{oc}	$A_3 H_{oc}$	$A_3 H'_{oc}$	M_{oc}
+10	16.29	-21.77	+0.76	-1.00	0.96
+8	16.44	-21.96	+0.86	-0.62	0.96
+6	16.58	-22.15	+0.96	-0.18	0.97
+4	16.73	-22.34	+1.07	+0.28	0.98
+2	16.89	-22.56	+1.18	+0.77	0.99
0	17.05	-22.78	+1.30	+1.30	1.00
-3	17.32	-23.14	+1.49	+2.17	1.02
-6	17.63	-23.56	+1.71	+3.12	1.03
-9	17.97	-24.01	+2.00	+4.17	1.05
-12	18.37	-24.55	+2.23	+5.40	1.08
-15	18.81	-25.14	+2.54	+6.81	1.10
-18	19.33	-25.83	+2.90	+8.40	1.13
-20	19.71	-26.34	+3.17	+9.61	1.15


Distance of principle plane from vertex of cornea
in mm.
H'dc
Hdc

(d) $H_C\ H'_{DC} = -\dfrac{d_4\, n_4\, F_D}{F_{DC}}$ where n = index of vitreous

$$= -\frac{.012\ (1.336)\ F_D}{F_{DC}}$$

(e) $F_{DC} = \dfrac{1}{F_{DC}}$

(f) $F_{DC}{}^1 = -\dfrac{n_4}{F_{DC}} = -\dfrac{1.336}{F_{DC}}$

In all of the above we have assumed the constants of the Gullstrand Schematic Eye.

The values of table 3 are represented graphically. Here is indicated the position of the principal points and focal points of the combined systems of ametropic eye and spectacle correction lens placed 12 mm. in front of the eye ($d_4 = H_D{}^1\ H_C = 0.12$ mm.).

The position of these same points, in the case of correction by contact lenses may be found in a similar manner (Table 4, p. 92).

Here again, the constants of Gullstrand's Schematic Eye are assumed, and therefore the radius of the anterior surface of the cornea = 7.7 mm.

r_2 = radius of posterior surface of contact lens: radius of anterior surface of liquid lens (saline solution).

F_2 = refracting power of anterior surface of liquid lens.

F_B = refracting power of liquid lens.

$A_2\ H_B$ = distance of first principal point of liquid lens from anterior surface of liquid lens.

$A_3\ H_B{}^1$ = distance of second principal point of liquid lens from posterior surface of liquid lens.

d_3 = distance between second principal point of liquid lens and first principal point of eye.

F_{BC} = refracting power of contact lens plus eye.

$H_B{}^1\ H_{BC}$ = distance of first principal point of combined system from second principal point of liquid lens.

$H_C\ H_{ABC}{}^1$ = distance of second principal point of combined system from first principal point of eye.

$A_3\ H_{ABC}$ = distance of first principal point of combined system from vertex of cornea.

$A_3\ H_{ABC}{}^1$ = distance of second principal point of combined system from vertex of cornea.

The values of these unknowns, for given values of r_2, may be obtained as follows:

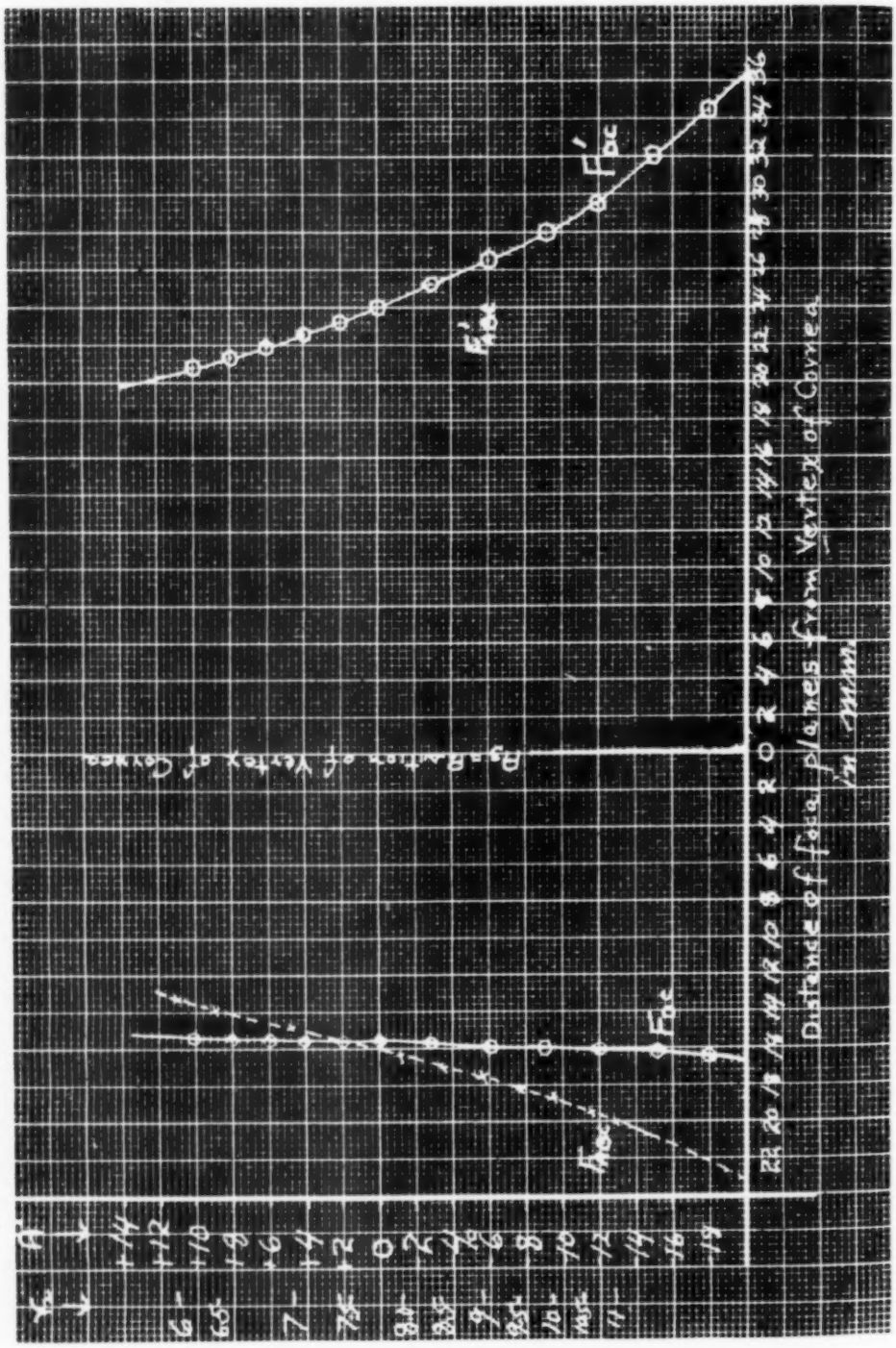
Table 4 and 5

Y_2	F_2	F_B	$A_3 H'_B$	$A_2 H_B$	d_3	F_{BC}	$H'_B H_{ABC}$
5	67.20	+24.47	-0.82	-0.54	+2.12	+80.07	+1.53
5.5	61.09	+18.44	-1.00	-0.70	+2.30	+74.59	+1.81
6.0	56.00	+13.27	-1.19	-0.98	+2.49	+69.97	+2.09
6.5	52.46	+9.67	-1.63	-1.34	+2.93	+66.55	+2.58
7.0	48.00	+5.14	-2.80	-2.52	+4.10	+62.54	+3.84
7.5	44.80	+1.89	-7.11	-6.88	+8.41	+59.60	+8.27
8.0	42.00	-1.00	+12.60	+13.00	-11 30	+56.96	-11.64
8.5	39.53	-3.47	+3.41	+3.74	-2.11	+54.74	-2.26
9.0	37.33	-5.64	+1.99	+2.31	-0.69	+52.77	-0.77
9.5	35.37	-7.69	+1.38	+1.69	-0.08	+50.91	-0.09
10.0	33.60	-9.50	+1.06	+1.37	+0.24	+49.27	+0.27
10.5	32.00	-11.12	+0.87	+1.17	+0.43	+47.80	+0.53
11.0	30.55	-12.09	+0.76	+1.08	+0.54	+46.93	+0.67
Y_2	$H_C H'_{ABC}$	$A_3 H_{ABC}$	$A_3 H'_{ABC}$	M_A	M_{BC}	M_{ABC}	A'
5	-0.87	+0.73	+0.43	1.03	+0.73	+0.75	+24.15
5.5	-0.76	+0.81	+0.54	1.03	+0.79	+0 81	+18.04
6.0	-0.63	+0 90	+0 67	1.03	+0.84	+0 87	+12.95
6.5	-0 48	+0 95	+0.82	1 03	+0.88	+0 91	+9.46
7.0	-0.45	+1 04	+0.85	1.02	+0.94	+0.96	+4.95
7.5	-0.36	+1 16	+0.94	1.02	+0.98	+1.00	+1.95
8.0	-0.27	+0.96	+1.03	1.02	+1.03	+1.05	-1.05
8.5	-0.18	+1.15	+1.12	1.02	+1.07	+1.09	-3.52
9.0	-0.10	+1.22	+1 20	1.02	+1.11	+1.13	-5.72
9.5	-0 02	+1.29	+1.28	1.02	+1.15	+1.17	-7 68
10.0	+0.06	+1.33	+1.38	1.02	+1.19	+1.21	-9.35
10.5	+0.13	+1.40	+1.43	1.02	+1.22	+1.24	-11.05
11.0	+0.19	+1.43	+1.49	1.02	+1.24	+1.26	-12.51

$F_2 = \frac{n_2 - n}{r_2} = \frac{.336}{r_2}$; and the others, from equations (4), (5), (6), (7), (8), (9) and (10).

The values obtained in table 4, of the position of the principal points and focal points of the ametropic eye corrected by contact lenses, are represented graphically.

A comparison of these two graphs indicates the following:



(1) The position of the first principal point in each of the combined systems remains fairly constant for both methods of correction.

(2) The position of the second principal point of the combined system in the case of the contact lens remains more near constant than in the case of spectacle lens corrections.

(3) The position of the first focal point of the combined system in the case of spectacle lens correction remains more nearly constant than in the case of contact lens corrections.

(4) The position of the second focal points of the combined systems is identical, for it is assumed that both the spectacle lenses and contact lenses are so selected as to correct all of the ametropia.

To further investigate the optical changes that occur when contact lenses are used instead of spectacle lenses, let us next consider the effect of both these methods on the size of the retinal image.

Let M_{DC} = magnification of the combined system of correction spectacle lens and ametropic eye than $M_{DC} = \frac{Fc}{F_{DC}}$

In an analogous way, the magnification of the combined systems of contact lens and ametropic eye would be $M_{ABC} = M_A \times M_B$, where M_A = magnification of the plano contact lens, and M_{BC} the magnification of the saline liquid lens and the eye. It can be shown* that $M_A = \frac{r_1}{r_2}$ and with equation (3),

$M_A = 1 + \frac{0.1702}{r_2}$, and $M_{BC} = \frac{F_C}{F_{BC}}$

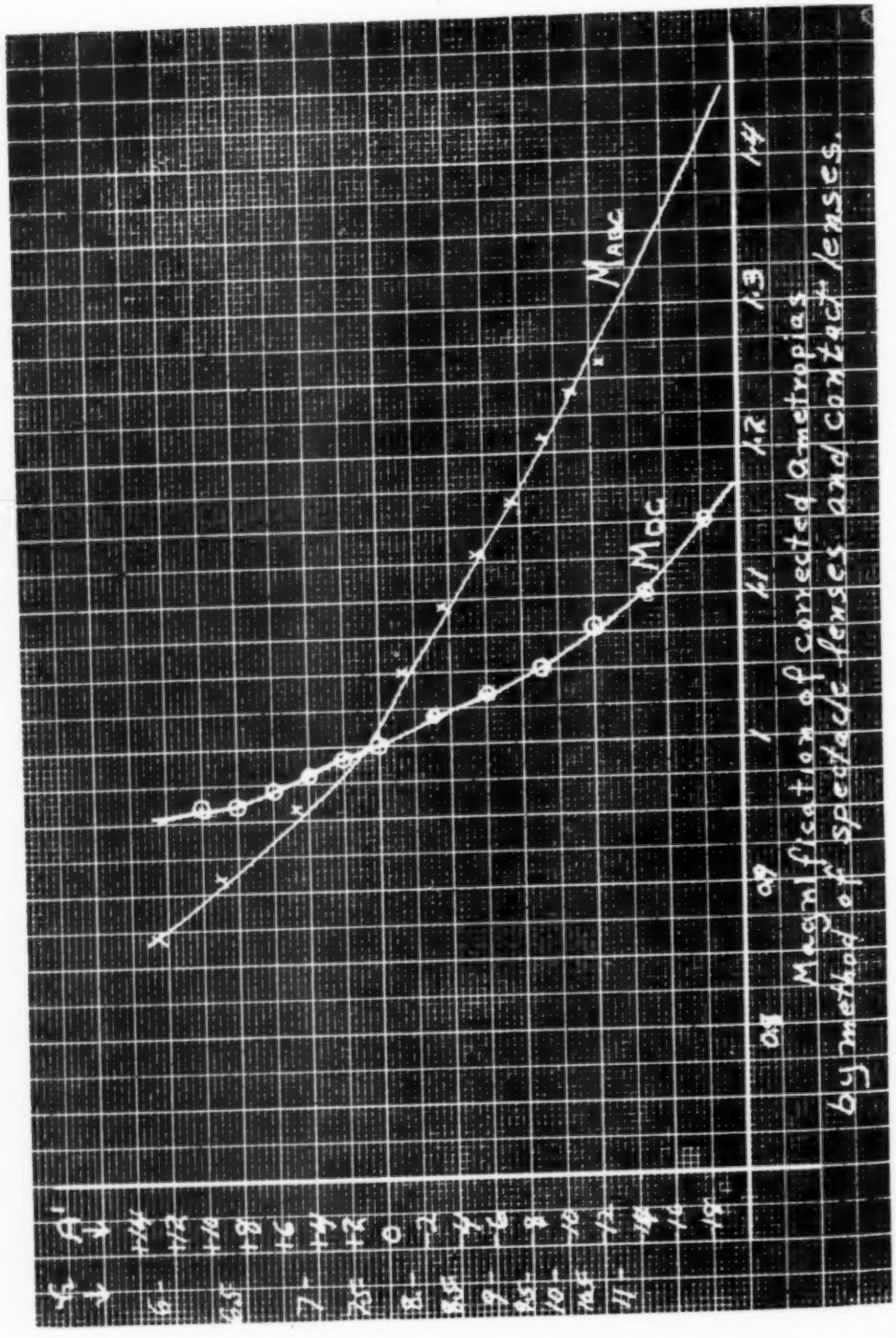
Table 5 gives the values of these magnifications for different degrees of ametropia.

These values are represented graphically.

It is apparent, in comparing these curves, that the use of the contact lens in cases of high myopia will tend to increase the size of the retinal image by as much as 50% in case of —20.00 D., as compared to 10% in the case when spectacle lenses are used. We should expect, therefore, a decided increase in acuity in minus cases over that obtained with spectacle lenses. In cases of hyperopia of the order of + 10.00 D., a corresponding decrease in retinal magnification is noticed, but will rarely be over 10%.

With the generalized optical theory of the contact lens as evolved above, the remaining problem is to determine the contact lens necessary to correct a given ametropia when the ophthalmometer reading is obtained.

*Uber Eine Methode Zur Subjectiven Prufung von Brillenwirkungen—Graefe Arch., 1912; pp. 189-205.



Magnification of corrected Ametropias by method of spectacle lenses and contact lenses.

Let Fo = Ophthalmometer reading in diopters
A^1 = Static error of the eye
F_{12} = Dioptric refraction of contact lens when filled with saline solution and placed in contact with the cornea.

Then, the necessary condition to be fulfilled, that the contact lens shall be a correction lens is

$F_{12} = A^1 + Fo$ and

$$F_{12} = \frac{n_2 - n}{r_2} = \frac{1.336 - 1}{r_2} = \frac{.336}{r_2} \text{ or}$$

$$r_2 = \frac{.336}{F_{12}} = \frac{.336}{A^1 + Fo}.$$

Since the number of values of r_2 are limited to 13, it follows that the only possible way to achieve a true correction is by adding either plus or minus refraction to these plano lenses. A series of possible combinations for whole dioptres of refraction is worked out in Table 6.

Table 6 is composed of two parts, one for myopia, the other for hyperopia. Suppose it is desired to determine what contact lens is necessary in order to correct —5.00 D. S., when the Ophthalmometer reads 47.00 D. Then, according to table 6, a contact lens of 8.0 mm. radius will as a first approximation correct this error. As another instance, suppose ametropia is —12.00 D. and the ophthalmometer reads 43.00 D., then the necessary correction lens in contact form will be $\frac{10.5}{-1}$, *i.e.*, the radius is 10.5 mm. and the refraction that must be ground into the lens is —1.00 D. In prescription form this would be:

Rx:

Corneal radius: 10.5 mm.
Refraction: —1.00 D.

When the cornea shows astigmatism so that two ophthalmometer readings exist, then the lower of the two is chosen for purposes of computation. For example, if the ophthalmometer reads

43.00 D. Mrd. 180
46.00 D. Mrd. 90

then 43.00 is the reading to be used in table 6 (pp. 97 and 98).

The values given in table 6 are only one of a possible number of values for each condition of ametropia and Ophthalmometer reading.

Technique of Adapting Contact Lenses to the Eye and Securing Tolerance

Just as it is important to understand the optics in the use of contact lenses, so is it equally important to have a proper technique

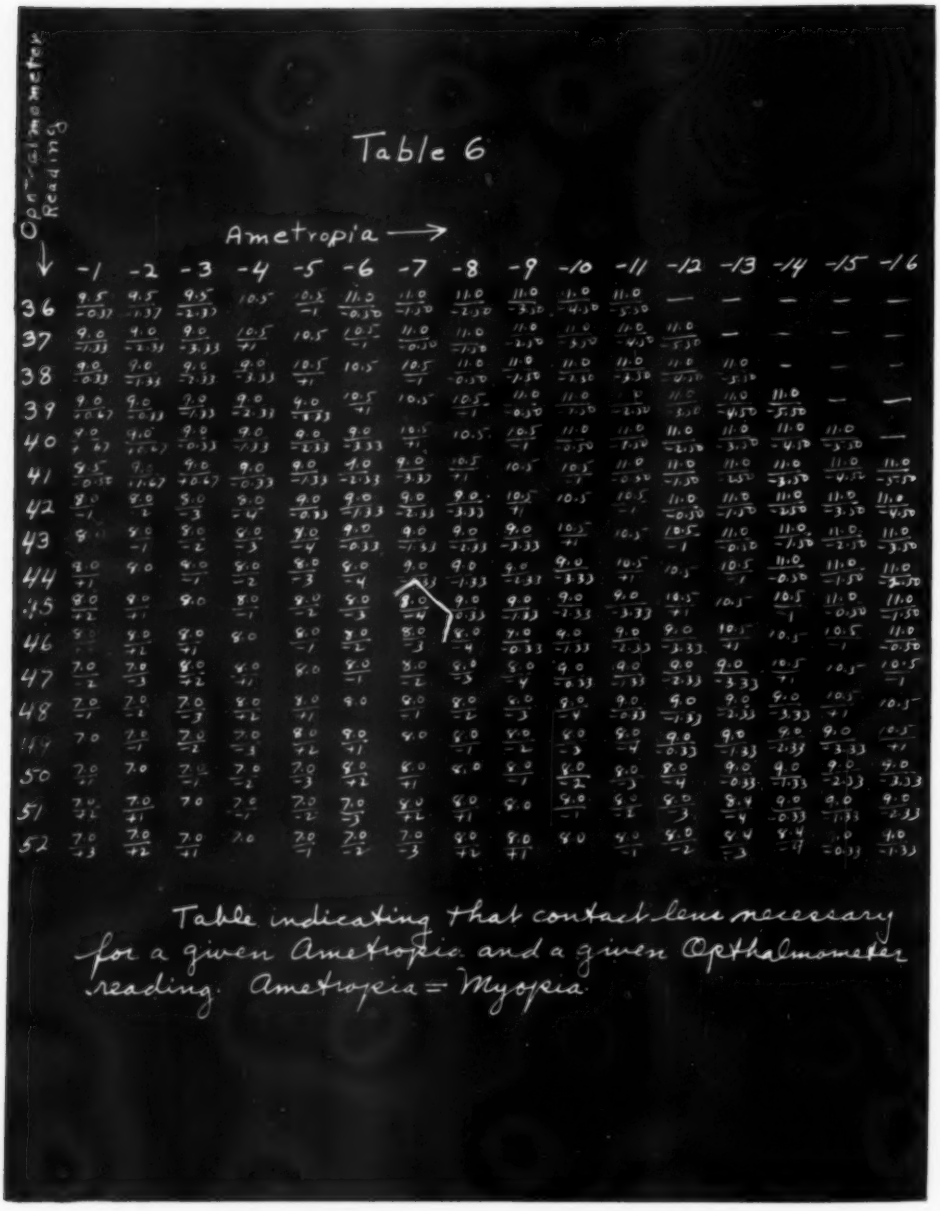


Table 6

Ophthalmometer Reading ↓ Ametropia →

	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12	-13	-14	-15	-16
36	9.5 / -0.37	9.5 / -1.37	9.5 / -2.37	10.5	10.5 / -1	11.0 / -0.50	11.0 / -1.50	11.0 / -2.50	11.0 / -3.50	11.0 / -4.50	11.0 / -5.50	—	—	—	—	—
37	9.0 / -0.33	9.0 / -1.33	9.0 / -2.33	10.5 / +1	10.5	10.5 / -1	11.0 / -0.50	11.0 / -1.50	11.0 / -2.50	11.0 / -3.50	11.0 / -4.50	11.0 / -5.50	—	—	—	—
38	9.0 / -0.33	9.0 / -1.33	9.0 / -2.33	9.0 / -3.33	10.5 / +1	10.5	10.5 / -1	11.0 / -0.50	11.0 / -1.50	11.0 / -2.50	11.0 / -3.50	11.0 / -4.50	11.0 / -5.50	—	—	—
39	9.0 / -0.67	9.0 / -0.33	9.0 / -1.33	9.0 / -2.33	9.0 / -3.33	10.5 / +1	10.5	10.5 / -1	11.0 / -0.50	11.0 / -1.50	11.0 / -2.50	11.0 / -3.50	11.0 / -4.50	11.0 / -5.50	—	—
40	9.0 / -0.67	9.0 / -0.67	9.0 / -0.33	9.0 / -1.33	9.0 / -2.33	9.0 / -3.33	10.5 / +1	10.5	10.5 / -1	11.0 / -0.50	11.0 / -1.50	11.0 / -2.50	11.0 / -3.50	11.0 / -4.50	11.0 / -5.50	—
41	9.5 / -0.17	9.0 / -0.67	9.0 / -0.67	9.0 / -0.33	9.0 / -1.33	9.0 / -2.33	9.0 / -3.33	10.5 / +1	10.5	10.5 / -1	11.0 / -0.50	11.0 / -1.50	11.0 / -2.50	11.0 / -3.50	11.0 / -4.50	11.0 / -5.50
42	9.0 / -1	9.0 / -1	9.0 / -1	9.0 / -1	9.0 / -0.33	9.0 / -1.33	9.0 / -2.33	9.0 / -3.33	10.5 / +1	10.5	10.5 / -1	11.0 / -0.50	11.0 / -1.50	11.0 / -2.50	11.0 / -3.50	11.0 / -4.50
43	9.0	9.0 / -1	9.0 / -2	9.0 / -3	9.0 / -4	9.0 / -0.33	9.0 / -1.33	9.0 / -2.33	9.0 / -3.33	10.5 / +1	10.5	10.5 / -1	11.0 / -0.50	11.0 / -1.50	11.0 / -2.50	11.0 / -3.50
44	9.0 / +1	9.0	9.0 / -1	9.0 / -2	9.0 / -3	9.0 / -4	9.0 / -0.33	9.0 / -1.33	9.0 / -2.33	9.0 / -3.33	10.5 / +1	10.5	10.5 / -1	11.0 / -0.50	11.0 / -1.50	11.0 / -2.50
45	9.0 / +2	9.0 / +1	9.0	9.0 / -1	9.0 / -2	9.0 / -3	9.0 / -4	9.0 / -0.33	9.0 / -1.33	9.0 / -2.33	9.0 / -3.33	10.5 / +1	10.5 / -1	10.5 / -1	11.0 / -0.50	11.0 / -1.50
46	9.0	9.0 / +2	9.0 / +1	9.0	9.0 / -1	9.0 / -2	9.0 / -3	9.0 / -4	9.0 / -0.33	9.0 / -1.33	9.0 / -2.33	9.0 / -3.33	10.5 / +1	10.5 / -1	10.5 / -1	11.0 / -0.50
47	7.0 / -2	7.0 / -3	9.0 / +2	9.0 / +1	9.0	9.0 / -1	9.0 / -2	9.0 / -3	9.0 / -4	9.0 / -0.33	9.0 / -1.33	9.0 / -2.33	9.0 / -3.33	10.5 / +1	10.5 / -1	10.5 / -1
48	7.0 / -1	7.0 / -2	7.0 / -3	9.0 / +2	9.0 / +1	9.0	9.0 / -1	9.0 / -2	9.0 / -3	9.0 / -4	9.0 / -0.33	9.0 / -1.33	9.0 / -2.33	9.0 / -3.33	10.5 / +1	10.5 / -1
49	7.0	7.0 / -1	7.0 / -2	7.0 / -3	9.0 / +2	9.0 / +1	9.0	9.0 / -1	9.0 / -2	9.0 / -3	9.0 / -4	9.0 / -0.33	9.0 / -1.33	9.0 / -2.33	9.0 / -3.33	10.5 / +1
50	7.0 / +1	7.0	7.0 / -1	7.0 / -2	7.0 / -3	9.0 / +2	9.0 / +1	9.0	9.0 / -1	9.0 / -2	9.0 / -3	9.0 / -4	9.0 / -0.33	9.0 / -1.33	9.0 / -2.33	9.0 / -3.33
51	7.0 / +2	7.0 / +1	7.0	7.0 / -1	7.0 / -2	7.0 / -3	9.0 / +2	9.0 / +1	9.0	9.0 / -1	9.0 / -2	9.0 / -3	9.0 / -4	9.0 / -0.33	9.0 / -1.33	9.0 / -2.33
52	7.0 / +3	7.0 / +2	7.0 / +1	7.0	7.0 / -1	7.0 / -2	7.0 / -3	9.0 / +2	9.0 / +1	9.0	9.0 / -1	9.0 / -2	9.0 / -3	9.0 / -4	9.0 / -0.33	9.0 / -1.33

Table indicating that contact lens necessary for a given Ametropia and a given Opthalmometer reading. Ametropia = Myopia

(Note—Table 6 is continued on page 98.)

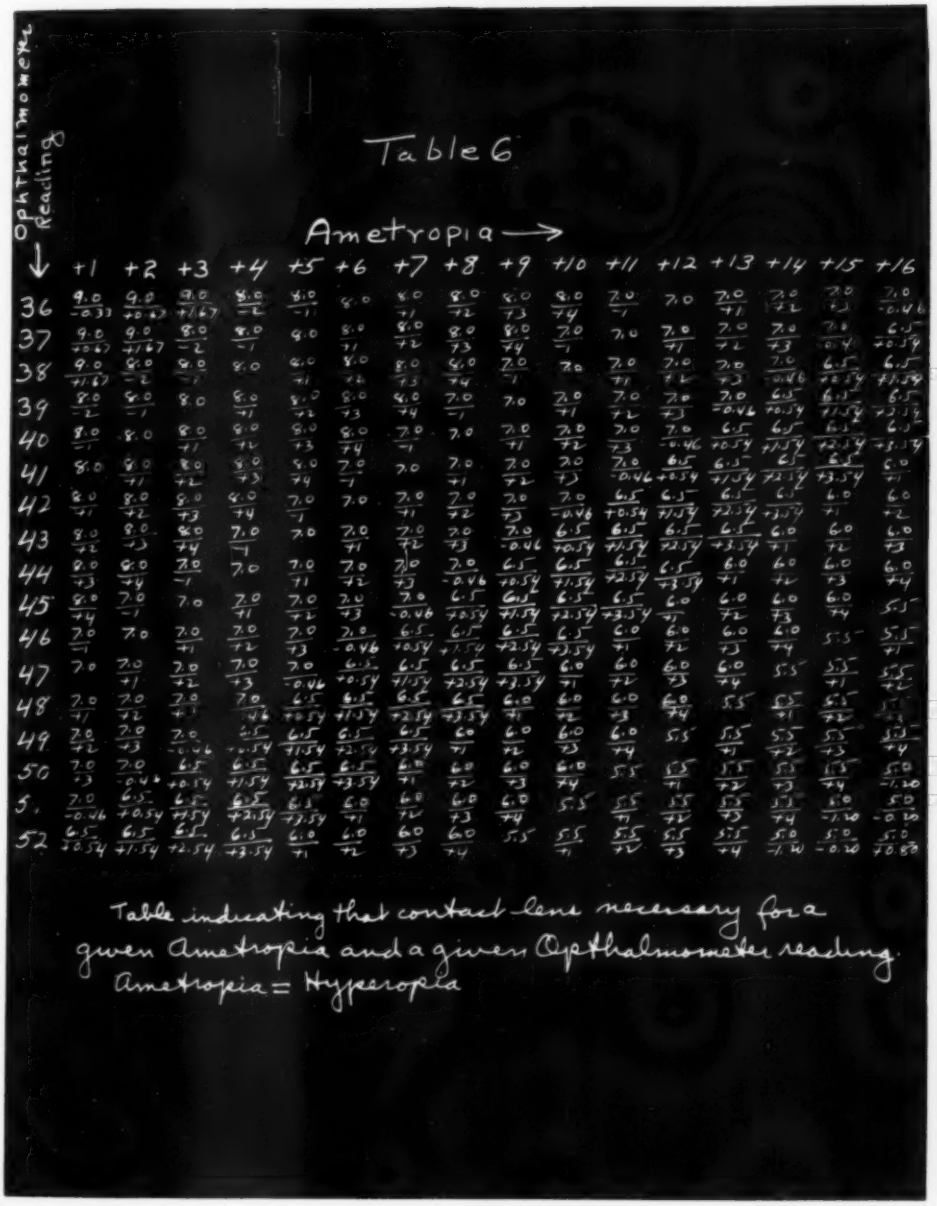


Table 6

Ametropia →

Ophthalmometer Reading ↓	+1	+2	+3	+4	+5	+6	+7	+8	+9	+10	+11	+12	+13	+14	+15	+16
36	9.0 / -0.33	9.0 / +0.67	9.0 / +1.67	8.0 / -2	8.0 / -1	8.0	8.0 / +1	8.0 / +2	8.0 / +3	8.0 / +4	7.0 / -1	7.0	7.0 / +1	7.0 / +2	7.0 / +3	7.0 / -0.46
37	9.0 / +0.67	9.0 / +1.67	8.0 / -2	8.0 / -1	8.0	8.0 / +1	8.0 / +2	8.0 / +3	8.0 / +4	7.0 / -1	7.0	7.0 / +1	7.0 / +2	7.0 / +3	7.0 / -0.4	6.5 / +0.54
38	9.0 / +1.67	8.0 / -2	8.0 / -1	8.0	8.0 / +1	8.0 / +2	8.0 / +3	8.0 / +4	7.0 / -1	7.0	7.0 / +1	7.0 / +2	7.0 / +3	7.0 / -0.46	6.5 / +0.54	6.5 / +1.54
39	8.0 / -2	8.0 / -1	8.0	8.0 / +1	8.0 / +2	8.0 / +3	8.0 / +4	7.0 / -1	7.0	7.0 / +1	7.0 / +2	7.0 / +3	7.0 / -0.46	6.5 / +0.54	6.5 / +1.54	6.5 / +2.54
40	8.0 / -1	8.0	8.0 / +1	8.0 / +2	8.0 / +3	8.0 / +4	7.0 / -1	7.0	7.0 / +1	7.0 / +2	7.0 / +3	7.0 / -0.46	6.5 / +0.54	6.5 / +1.54	6.5 / +2.54	6.5 / +3.54
41	8.0	8.0 / +1	8.0 / +2	8.0 / +3	8.0 / +4	7.0 / -1	7.0	7.0 / +1	7.0 / +2	7.0 / +3	7.0 / -0.46	6.5 / +0.54	6.5 / +1.54	6.5 / +2.54	6.5 / +3.54	6.0 / +1
42	8.0 / +1	8.0 / +2	8.0 / +3	8.0 / +4	7.0 / -1	7.0	7.0 / +1	7.0 / +2	7.0 / +3	7.0 / -0.46	6.5 / +0.54	6.5 / +1.54	6.5 / +2.54	6.5 / +3.54	6.0 / +1	6.0 / +2
43	8.0 / +2	8.0 / +3	8.0 / +4	7.0 / -1	7.0	7.0 / +1	7.0 / +2	7.0 / +3	7.0 / -0.46	6.5 / +0.54	6.5 / +1.54	6.5 / +2.54	6.5 / +3.54	6.0 / +1	6.0 / +2	6.0 / +3
44	8.0 / +3	8.0 / +4	7.0 / -1	7.0	7.0 / +1	7.0 / +2	7.0 / +3	7.0 / -0.46	6.5 / +0.54	6.5 / +1.54	6.5 / +2.54	6.5 / +3.54	6.0 / +1	6.0 / +2	6.0 / +3	6.0 / +4
45	8.0 / +4	7.0 / -1	7.0	7.0 / +1	7.0 / +2	7.0 / +3	7.0 / -0.46	6.5 / +0.54	6.5 / +1.54	6.5 / +2.54	6.5 / +3.54	6.0 / +1	6.0 / +2	6.0 / +3	6.0 / +4	5.5 / +0.54
46	7.0 / -1	7.0	7.0 / +1	7.0 / +2	7.0 / +3	7.0 / -0.46	6.5 / +0.54	6.5 / +1.54	6.5 / +2.54	6.5 / +3.54	6.0 / +1	6.0 / +2	6.0 / +3	6.0 / +4	5.5 / +0.54	5.5 / +1.54
47	7.0	7.0 / +1	7.0 / +2	7.0 / +3	7.0 / -0.46	6.5 / +0.54	6.5 / +1.54	6.5 / +2.54	6.5 / +3.54	6.0 / +1	6.0 / +2	6.0 / +3	6.0 / +4	5.5 / +0.54	5.5 / +1.54	5.5 / +2.54
48	7.0 / +1	7.0 / +2	7.0 / +3	7.0 / -0.46	6.5 / +0.54	6.5 / +1.54	6.5 / +2.54	6.5 / +3.54	6.0 / +1	6.0 / +2	6.0 / +3	6.0 / +4	5.5 / +0.54	5.5 / +1.54	5.5 / +2.54	5.5 / +3.54
49	7.0 / +2	7.0 / +3	7.0 / -0.46	6.5 / +0.54	6.5 / +1.54	6.5 / +2.54	6.5 / +3.54	6.0 / +1	6.0 / +2	6.0 / +3	6.0 / +4	5.5 / +0.54	5.5 / +1.54	5.5 / +2.54	5.5 / +3.54	5.5 / +4.54
50	7.0 / +3	7.0 / -0.46	6.5 / +0.54	6.5 / +1.54	6.5 / +2.54	6.5 / +3.54	6.0 / +1	6.0 / +2	6.0 / +3	6.0 / +4	5.5 / +0.54	5.5 / +1.54	5.5 / +2.54	5.5 / +3.54	5.0 / +4.54	5.0 / -1.20
51	7.0 / -0.46	6.5 / +0.54	6.5 / +1.54	6.5 / +2.54	6.5 / +3.54	6.0 / +1	6.0 / +2	6.0 / +3	6.0 / +4	5.5 / +0.54	5.5 / +1.54	5.5 / +2.54	5.5 / +3.54	5.0 / +4.54	5.0 / -1.20	5.0 / -0.20
52	6.5 / +0.54	6.5 / +1.54	6.5 / +2.54	6.5 / +3.54	6.0 / +1	6.0 / +2	6.0 / +3	6.0 / +4	5.5 / +0.54	5.5 / +1.54	5.5 / +2.54	5.5 / +3.54	5.5 / +4.54	5.0 / -1.20	5.0 / -0.20	5.0 / +0.80

Table indicating that contact-lens necessary for a given Ametropia and a given Ophthalmometer reading.
Ametropia = Hyperopia

of adapting contact lenses to the eye, to be able to secure tolerance.

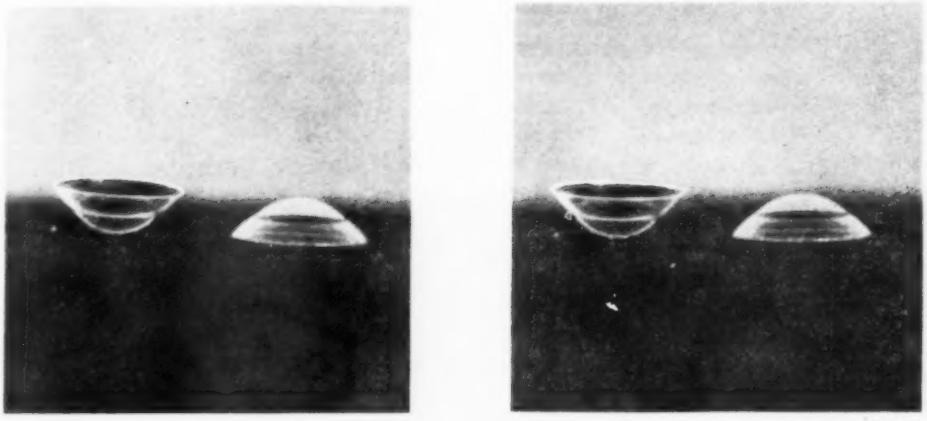
The introduction of a contact lens onto the eye is equivalent in some ways to introducing a foreign body on the sclera. Since the contact lens does not touch the cornea, it is not fair to compare this lens to a foreign body on the cornea. The reaction to such a state of affairs is generally recognized as excessive lachrimation, congestion of the sclera and conjunctiva of the lids, photophobia, some slight pain, etc. It is also known that if the foreign body is not too irritating, that after a short time these symptoms subside and the local conditions return to normal, with the foreign body still present. At present, since it is desirable to avoid the initial period of discomfort, when the lens is introduced onto the sclera, some solution is used to anaesthetize the eye. The solution suggested by the physician working in conjunction with the writer was a 2% Butyn Sol. This is a product of the Abbott Laboratories, North Chicago, Ill., U. S. A. Two drops of this solution will anaesthetize the eye within a minute or two and will remain active for about an hour. It is superior in these cases to cocaine, in the fact that it neither dilates the pupil nor affects the accommodation.

The saline solution used to fill the contact lens is of one-half normal strength. This solution at body temperatures may be assumed to have an index of refraction = 1.336.

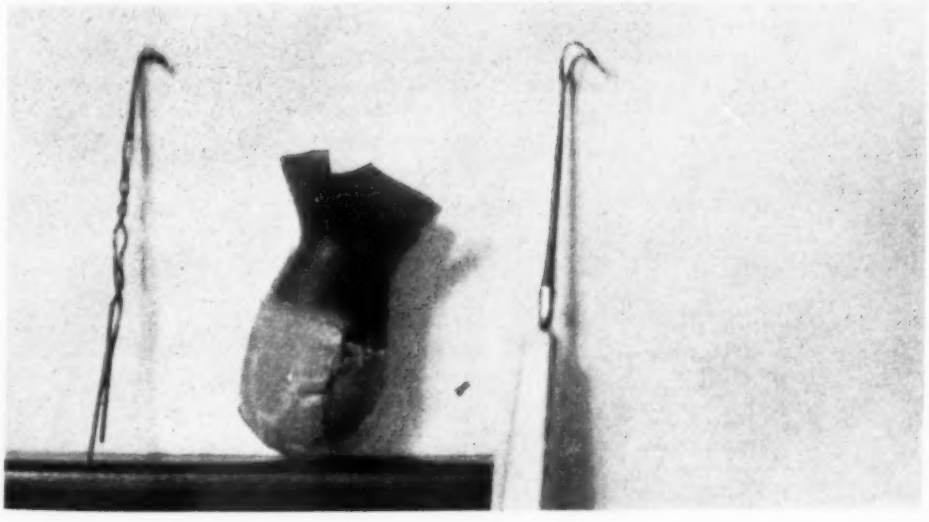
The necessary apparatus for inserting these lenses, and removing them, are very simple ones. O'Rourke, in his excellent article on the use of the contact lens in Kerataconus, presents an original method for inserting these lenses, which is indeed practical. This method would not be readily acceptable in cases where the patient might desire to insert the lens at some place away from home. The apparatus that O'Rourke has presented, while simple, is too cumbersome to be carried about.

The method desired is one that will enable the patient to insert the lens easily and quickly almost any place the patient might be. The following method has been finally evolved. A rubber nipple, from a baby bottle (see photograph, p. 100), is cut down to proper size, then possibly three or four scallops are cut at the edge, so as to permit the rubber to widen more easily. The contact lens is then placed onto this lens holder as it will hereafter be designated. The convex surface is, of course, face down. The hollow or concave portion may then be filled with saline solution (an ordinary medicine dropper is used), about 10 to 12 drops fill the lens completely.

The contact lens is held onto the eyeball by suction due to the capillary action. To remove the lens it is necessary to break up this suction. To break up this suction, it is necessary to raise one of the edges of the lens from the sclera. This is done with a blunt hooked device (see photograph, p. 100). This book is introduced gently towards the outer canthus onto the lens, and slid along the lens until it drops onto the sclera, then it is gently inserted beneath the lens, the lids



Wm. Feinbloom. Stereoscopic photograph of Contact Lenses.



Wm. Feinbloom. Apparatus for inserting and removing Contact Lenses

drawn apart, or opened wide, and the hook pulled forward, and the lens will drop out.

In actual practice the following are the necessary steps after one has decided to insert the lens and has selected the lens for insertion:

1. Seat the patient before a table or desk upon whose surface is placed either a blotter or towel (this to prevent breaking the lens should it fall to the table).

2. Insert two drops of Butyn in the eye. (Wait a few minutes after this for the Butyn causes a slight burning sensation and some congestion of the sclera.)

3. Carefully clean (with a few drops of saline sol.) the contact lens and the surface of the lens holder. (This is very important, since the introduction of any particles of dirt under the contact lens will eventually cause considerable discomfort.)

4. Fill the lens with saline solution. (Make certain that the solution is clean. Use a rubber cork for the bottle containing saline solution. It is most advisable to hold the medicine dropper filled with the solution in the closed hand for a few minutes so that it may assume body temperature.)

5. When the doctor inserts the contact lens, the patient is instructed to draw the lower lid down with his own fingers, making certain that he is holding the lashes of the lower lid with his finger. The doctor draws the upper lid up in the same way.

6. The patient is instructed to lean over the table so that his face is parallel to the table and possibly 6 inches from it.

7. The doctor holds the lens holder containing the lens filled with solution in his free hand, under the patient's eye which is to receive the lens, and instructs the patient to keep looking straight down through the lens at the center of the lens holder. The patient is also to slowly approach the lens holder as the doctor slowly moves the lens nearer the eye. The lens is then moved up as the head moves down until the lens is in contact with the sclera. The lens is held there for two or three seconds and the patient instructed to release the lower lid while the doctor releases the upper. Care must be exercised not to touch the lids as the lens approaches the eye, for should some of the liquid be lost, an air bubble may form under the lens which would interfere with vision.

Should the patient be inserting the lens himself, then he uses the thumb and forefinger of one hand to retract the lids, and uses the other hand to insert the lens.

For removing the lens, the doctor holds the hook almost parallel to the face as the patient leans over the table and engages the lens with the hook near the outer canthus instructing the patient to open the lids wide, or possibly retracting them with the fingers. The doctor then gently pulls the lens forward and the lens will drop out onto the table.

When the patient removes the lens, he is instructed to hold the hook in the same way, as he leans over the table. In actual cases the patients are supplied with these hooks, which are made of small thin hairpins bent into the proper form. The patient places the hook in contact with the lens while it is in his eye, and then slides it towards the outer canthus until he feels it drop onto the sclera. He then engages the lens with the hook and pulls gently forward, retracting his lids with the fingers of the other hand. When removing the lens it was found the patient could do so easiest, if he held the hook in the left hand to remove the lens from the right eye, and in the right hand when removing it from the left eye.

The actual length of time for inserting a pair of these lenses and removing them, after a little practice, is about two minutes.

For a patient to make practical use of these lenses, whether it be for correction of Kerataconus or ordinary ametropias, it is evident that the doctor must assure himself that the patient can comfortably wear the lenses for a certain period, and that no after-effects are produced. For example, suppose a patient is a dancer, and requires the use of the lenses for periods of two hours at a time, being willing to use her spectacle correction at other times. Then the contact lenses should not be given to the patient until by actual trial the doctor is certain that the patient can wear the lenses, say, for four hours with comfort.

With some of the reports of cases wherein these lenses were actually used and prescribed, will be given a detailed description of the length of time the patient was permitted to wear them at each visit.

In general, it is best to have the lens worn about 15 minutes at the first visit, then increase this period to about one-half hour, then an hour, then in steps of about one-half hour each time. As one becomes more familiar with the reaction of the patient he can judge when best to discontinue the use of the Butyn. It is best to discontinue it as soon as possible, yet if done before the patient has developed sufficient tolerance, the patient will be uncomfortable. When the use of the Butyn is discontinued for the first time, it is best not to so inform the patient, for they usually become more sensitive when they learn that no anaesthetic is to be used.

As long as the patient is under the optometrist's care, which should be at least one month, he should always examine the cornea with the ophthalmoscope and slit lamp (the hand model will do). He should be particularly careful that the lens has not touched the corneal surface.

Case Reports

Subject, W. F. Date 4/8/30.

Contact lens tried to determine by actual experience the various factors concerned in their use.

Two drops of Butyn inserted in O. S. Contact lens inserted easily in O. S. Removed after 15 minutes. Some difficulty in remov-

ing, for it was first suggested it be removed by introducing hook at inner canthus. This area seemed too sensitive, so outer canthus tried and lens easily removed. The lens had been inserted by another party.

The second trial lens was inserted by subject, and found to be much easier. This is generally so, that the patient can insert the lenses more easily than the doctor.

Subject, I. F. Date 4/8/30.

Similar experiment as above. Same technique. Some difficulty in inserting lens in her eye, but no difficulty in removing it. Worn 15 minutes.

Subject, W. F. Date 4/9/30.

Inserted lens in O. D., then O. S. Used Butyn. Worn about two hours in each eye. Some slight discomfort after two hours.

Subject, W. F. Date 4/12/30.

Inserted lens in O. S. Used Butyn. Worn four hours. No discomfort.

Patient, H. F. Date 4/9/30.

History of Lenticonus since childhood. V. A. past few years with Rx O. D. 20/200, O. S. 20/30. No particular difficulty with eyes up to 11/29 when patient reported marked drop in V. A. Diagnosis of Kerataconus then made very much marked in O. D. only slight in O. S. V. A. with same Rx O. D. 2/200, O. S. 20/100. Contact lens inserted in O. D. 7.1 mm. radius together with —3.00 D. S., gave V. A. 20/70 . Wore lens for 15 minutes. Used Butyn. Easily inserted and removed.

Date 4/13/30.

Contact lens inserted in each eye with Butyn.

R. 7.1 mm. —3.50 —1.50 x 45 gave 20/60.
L. 7.1 mm. —4.00 —1.50 x 60 gave 20/30.
R. 7.1 mm. —3.50 —1.50 x 45.
L. 8.1 mm. +2.50 —1.50 x 60 O. U. to 20/25.

Wore lenses about one-half hour. Then removed and again tried later in the day for two hours. The scleral diameter of the left lens seemed too small for rim of lens pressed into sclera. (Each time the lenses were inserted the eye was examined with slit lamp to see just how scleral edge fitted the sclera.)

Date 4/20/30.

Could not insert contact lenses on this day without air bubbles. Patient very sensitive on this day. The congestion that results from the use of Butyn at times is greater than from the insertion of the lens.

Date 4/21/30.

Contact lens inserted in O. D. Used 7.1 mm. radius at 11:15 A. M. Patient to report within three hours. Did not report back until 5:00 P. M. when it was removed. Note: congestion before removal was a minimum—patient had felt little discomfort. In

words of patient, "was just a strange feeling." Not like a foreign body as on day when it could not be properly inserted. When lens was removed, sclera immediately became congested. (Poor technique in removal?) A ridge extended around sclera where glass had pressed. Excessive lachrimation and marked photophobia existed. Nothing further was done. Patient dismissed.

Date 4/22/30.

Patient reported next day, and on advice of physician, told to use Boric acid solution. Congestion subsided within a few hours. Cornea perfectly clear. Consultation as to prognosis of conical cornea condition led to suggestion of pressure bandage, and treatment by physician. Use of contact lenses advised. Patient declined treatment.

Subject, W. F. Date 8/6/30.

Contact lens 7.1 mm. inserted in O. S. at 3:45 P. M. Very easily inserted—no air bubbles—no pain—had used two drops Butyn. Slight congestion due to Butyn—conducted four routine eye examinations with lens in eye. Used Rx O. D. +.25 D. S., O. S. —6.00 D. S. The only difficulty experienced seemed to be in the vertical diplopia when looking either up or down. By measurement there seemed to be 2.5 D. right hyperphoria. Of course, —6 D. myopia had been produced. After about three and one-half hours, a film seemed to descend over the left eye, and halos were visible when looking at lights. These were of the same type as described in cases of Glaucoma. Possible explanations thought of was that oil from the meibomian glands entered beneath the contact lens and filtered through slowly, so that oil would always be present. (This phenomenon was not complained of by any of the subjects who wore these lenses). This film or halo gradually decreased the acuity to 20/30. (It was 20/20 at the beginning with the —6.00 D. S.) This halo was also visible binocularly, *i.e.*, when fusing with both eyes. No discomfort was experienced during all this time. The O. S. was somewhat congested. At the supper table, where 8 people were present, no one noticed anything peculiar about the eye. I. F. after a while noticed the congestion and immediately surmised what it was. The regular spectacle lenses were not worn after 8:00 P. M. The contact lens was removed at 11:00 P. M. having been worn a period of 7 hours. (From experiments conducted later, it is felt that this was an error. The lenses should not be worn such a long time when they had not recently been used). Some difficulty was experienced in removing the lens, possibly due to the fact that a new technique and instrument for doing so were used for the first time. Upon removal, the film persisted. V. A. 20/30. Eye washed with boric acid sol., congestion gradually disappeared and by 2:00 P. M., V. A. was 20/20 and eye perfectly clear. (In order to prevent congestion from occurring when lens was removed, the physician suggested using one drop adrenalin chloride 1:1000, first, a few minutes after Butyn was inserted and then one drop every hour. The purpose being to constrict the capillaries so that when the lens was

removed, and hence the pressure on the sclera, the capillaries would not be flooded with blood, causing congestion

Date 8/11/30.

Inserted contact lens in O. S. using Butyn first. Two drops Butyn used. Then, after a few minutes, one drop adrenalin. This immediately cleared up the congestion. Contact lens then inserted-easily-no congestion occurred. After one hour another drop of adrenalin used. No congestion appeared at all. Lens removed one-half hour later. Slight congestion occurred where hook touched sclera.

Date 8/15/30.

After reading Heine's article and report on ten cases, it was decided to try lens without butyn. Heine mentions no technique and no use of anaesthetic. At 4:05 P. M., tried inserting lens in O. S., but was unsuccessful at first trial. Saline sol. was too cold, then warmed sol. with hot water, but again could not insert lens because solution was too warm. Then kept solution at body temperature and easily inserted lens.

Report of Heine's Cases

Case 1. G. M. Female, 16 yrs. of age. Family of myopia and astigmatism. Refraction —7.00 —3.00 × 180 to 6/8.
Contact lens 9 mm. to 6/12 combined with —1.00 D. S. to 6/5. The —1.00 was used because the 9 mm. radius was 0.2 mm. too large.

Case 2. Female, 35 yrs. of age, concert singer, myopia and astigmatism. R. —3.00 —2.00 × 180 to 6/8.
L. —6.00 —2.00 × 180 to 6/8.
Contact lens R. 8.1 mm. to 6/8 L. 8.6 mm. to 6/8 to 6/6.
Patient could hardly wear contact lenses for 1 hour at first. Now she can wear them as long as she wishes. At one time she slept through the night with lenses.

Case 3. Young lady B. L. 20 yrs. of age.
O. U. —6.00 —1.00 × 180 to 6/6.
Contact lens 9 mm. to 6/6. Patient could only use lens 15 minutes at first. In a few weeks could wear lenses 3 to 4 hours. In such a case patient uses lens in R. eye in A. M. and L. eye in P. M.

Case 4. Lady 43 yrs. of age. Myope of —20.00 D. Vision R. fingers Rx of no aid L. —20.00 D. S. to 6/33. With contact lens in L. eye, 11 mm. and —3.00, vision to 6/36. Note: Without spectacle lens of —3.00 could use lens for near and housework. This patient had difficulty securing employment due to appearance of —20.00 D. S. No difficulty with contact lens.

Case 5. Case B. 15 years old. O. U. —2.75 D. S. to 6/6.
Contact lens 8.1 mm. to 6/5.

Case 6. Case P. 48 yrs. old. Cataract operation.
O. U. +12.00 +3.00 × 180 to 6/6.
Add +3.00 for near.

On one eye contact lens of 6.0 mm. for distance, on other eye 5.5 mm. for near. Patient uses lenses comfortably from A. M. to P. M.

Case 7. Case S. M. Age 28 yrs. Cataract operation.
V. A. with Rx R. 6/18 to 6/8.
Contact lens R. 6.5 mm. to 6/10 add —2.00 to 6/6.
Contact lens L. 6.5 mm. to 6/6.

Case 8. Case G. Cataract operation.
Rx O. U. +20.00 to 6/36.
Contact lens 5.5 mm. to 6/12.
Also contact lens of 5.0 mm. combined with —3.00 D. S.
Previous condition of trichiasis and pannus have considerably improved while using contact lenses.

Case 9. Case A. G. Age 30 yrs.
R. normal.
L. trachoma, pannus, myopia and conical cornea. Vision, fingers at ½ meter. Contact lens 7.6 mm. for O. S. Use of lens caused less irritation. After one month V. A. of O. S. 1/10. Patient has worn glass for 14 days without removal.

Case 10. Case F. Age 20 yrs.
R. +2.00 × 90 to 6/24.
L. +1.00 × 90 to 6/12.
Contact lenses O. U. 7.6 mm. to 6/12.

Subject A. B. Date 8/20/30.

Age 30 yrs. Patient of Dr. J. F. Hill. Rx approximately O. U. —2.00 +11.00 × oblique gives O. U. 20/40. Condition not one of conical cornea. Contact lens in O. D. and O. S. of 7.1 mm. combined with —4.00 —1.50 × oblique gave 20/20. Patient remarked print and objects appeared much clearer, no spots, etc., before eyes. Lenses easily inserted and removed—used Butyn. No marked congestion.

Subject Dr. C. J.

The object of this experiment was to determine whether an exchange of tears and saline solution occurred. Under the direction of the physician one drop of mercurochrome (2% sol.) was instilled onto the sclera at the outer canthus after the lens had been inserted. The mercurochrome was placed outside the area occupied by the contact lens. In a few minutes the mercurochrome was seen to pass under the contact lens and gradually pass through the lens and out on the side of the inner canthus. This was repeated several times on different subjects with the same result. From this one can conclude that an exchange of tears and saline solution occurs.

Patient Miss A. G. Date 8/7/30.

Age 20 yrs. Patient of Dr. I. Strauss. Refraction O. U. —8.00 —1.25 × 180 to 20/25. Conditions seem favorable, *i.e.*, clear media, normal size cornea, no exophthalmos, no adhesions, etc. Palpe-

bral aperture rather small. Patient referred to physician for medical examination and opinion. His report indicated perfectly good physical condition and good subject. He prescribed Butyn sol. 2% and adrenalin 1:1000 as directed (8/8/30).

Date 8/11/30.

Contact lens 7.1 mm. inserted in O. D. Butyn used first. Easily inserted by doctor. No discomfort. Patient highly pleased with invisibility. Worn about 20 minutes to one-half hour and then removed. Eye then washed with boric acid sol. as directed by physician. Slight congestion visible.

Date 8/13/30.

Lens again inserted in O. D. Butyn used. No difficulty. Wore lens one hour. Washed eye with boric acid sol. No discomfort. Congestion following previous use of lens passed away in about one hour.

Date 8/17/30.

Lens again inserted in O. D. Patient inserted lens on this date. Took 3 trials. Butyn used. Patient removed lens herself after 10 minutes. Very easily done. Inserted lens herself in O. S. and removed it after 15 minutes. This was done for practice. Then patient inserted lens in O. D. and used one drop adrenalin. Patient wore lens for four hours, reporting to office every two hours. (We know now that this was too long a time after wearing it only one hour a week ago). After four hours sclera and lids congested. Adrenalin cleared up congestion.

Date 8/20/30.

Lens inserted in O. D. after 2 drops Butyn followed by one drop adrenalin. Lens inserted by patient. Wore lens from 10:45 A. M. to 4:15 P. M., a period of 5½ hours. Patient wore lens at work during this time—came in contact with 20 to 30 people. No one observed it, wore her own glasses too. Inserted one drop adrenalin in O. D. each hour for first two, but not after that. Only slight congestion visible after 5½ hours.

Date 8/26/30.

Patient inserted lens in O. D. without using Butyn. Took two trials. No discomfort. Made certain that saline solution was of body temperature. No congestion appeared. Wore lens for exactly five hours without using Butyn or adrenalin. The resulting congestion was negligible. When lens was inserted on this day an air bubble was present. This was permitted to remain because it made practically no change in patient's refraction. (Patient had been using trial contact lenses for purpose of producing tolerance before proper lenses were ordered). Ordinarily, when this lens was worn, an additional myopia of —1.50 D. was produced. Lens removed by doctor, without the use of Butyn. Eye washed with boric acid sol. Patient had felt no discomfort during entire 5 hours. Claimed it felt same as when Butyn was used. Examination with slit lamp showed perfectly clear cornea. (Patient was examined with slit lamp and ophthalmoscope both at

beginning and end of each visit.)

Date 9/2/30.

Patient inserted lens in O. D. Two trials necessary. Wore same for seven hours. Used no drugs at all. Minimum congestion upon removal.

Date 9/9/30.

Patient required 5 trials before lens was inserted in O. D. Wore same for 7½ hours going about city and doing usual daily work. No discomfort. No drugs used.

Date 9/16/30.

Patient easily inserted lens in O. S. at first trial. Worn about one-half hour. Then removed, and inserted in O. D. Then removed and inserted in O. S., no difficulty or discomfort. No drugs used. No congestion.

Date 9/29/30.

Patient practiced inserting and removing lenses in each eye—some difficulty in inserting at times—none in removing. Had lens in each eye about 4 times for 15 minutes each.

Date 10/7/30.

Contact lens 9.0 mm. radius corneal radius and 12.0 mm. scleral radius of zero refracting power used. Inserted first in O. D. then O. S. With add of +1.00 V. A. to 20/20—. Wore lens for about one hour in each eye. Easily inserted and removed. It was at once apparent that the scleral curve of 12.0 mm. was too large, for some of the saline solution was lost as patient wore lens. No drugs used. An order placed for corneal radius 9 mm. add +1.00, scleral radius 11.0 mm.

Date 10/14/30.

Contact lens 9 mm. radius inserted by patient in O. D., then O. S. and removed. Practiced insertion and removal. No discomfort —no drugs used.

Date 10/26/30.

Patient practiced for two hours without use of drugs, inserting and removing lenses.

Date 11/14/30.

New set of contact lenses, as ordered above, tried. Corneal curve 9 mm., scleral curve 11mm., refraction +1.00. Lenses easily inserted without a bubble. No drugs used. In presence of 2 other optometrists, V. A. O. U. = 20/20. Lenses worn 2 hours. (Note that 3 weeks had elapsed since last use of lenses, entirely too long a time!)

Date 11/17/30.

Patient inserted contact lenses herself in each eye. No drugs, at 10:30 A. M. Slight discomfort at 11:00 A. M. Patient left office at 12:00 noon—no discomfort. Instructed to phone at slightest discomfort. Patient phoned at 4:00 P. M., stating no discomfort, but some congestion. Had used adrenalin (one drop) to clear this up.

Patient returned at 7:30 P. M. and removed lenses herself. (She had worn them 9 hours, entirely too long in view of the fact that she had not used them for some time.) No discomfort until 10:00 P. M. when a blepharospasm appeared—some pain. Patient complained next day she had slept poorly that night.

11/18/30.

Patient examined by physician and diagnosis of slight erosion of superficial epithelium. Patient treated by physician with cocaine and Rx. (This again emphasizes the care that must be exercised in using the lenses for a long period).

11/19/30.

Symptoms all subsided. V. A. normal. Continued treatment until next day.

11/20/30.

Condition entirely cleared up. Cornea clear—V. A. normal. Advised waiting a few days before use of contact lenses.

11/25/30.

Contact lenses inserted in each eye—some discomfort. Patient much more sensitive than previously. Lenses worn one-half hour and then removed. Butyn used.

11/26/30.

Butyn used. Lenses inserted and worn one hour. Examined under Koeppe slit lamp, which showed definitely that lens did not touch cornea. Cornea perfectly clear.

11/27/30.

No Butyn used. Lenses worn one hour. Patient more photophobic now than a month ago.

11/28/30.

Patient inserted lenses—worn 2 hours. No marked discomfort. Easily inserted and removed.

11/29/30.

Lenses worn 2 hours. No discomfort, no drugs.

11/30/30.

Lenses worn 2 hours. No discomfort, no drugs.

12/2/30.

Lenses given to patient to take home with final instructions as to their use and to phone each day.

12/3/30.

Phoned—used lenses one hour with no discomfort and no drugs.

12/4/30.

Phoned—used lenses 2 hours. No drugs—no discomfort—some photophobia.

Patient, Mr. M. S. Date 9/8/30.

Age 29. Patient of Dr. G. Robin.

Refraction R. —16.00 D. S. to 10%
L. — 4.00 D. S. to 80%

O. D. has congenital coloboma of iris, and partial optic nerve atrophy. Patient always been under impression that O. D. was completely blind. Eyeballs seem rather small, palpebral apertures also rather small. Previous Rx is R. —4.00 D. S.
L. —4.25 —1.00 × oblique. Patient referred to physician who thoroughly examined him and reported him a suitable subject. Prescribed Butyn and adrenalin.

9/12/30.

Contact lens 7.1 mm. inserted in O. D., used 2 drops Butyn. Some difficulty in insertion. No discomfort. Worn 15 minutes.

9/24/30.

Contact lens 7.1 mm. inserted in O. D. Used Butyn. Worn one-half hour. Then inserted in O. S., worn for 15 minutes. No discomfort. Used Butyn—no adrenalin. (Patient's occupation takes him from city for weeks at a time.)

11/1/30.

Contact lens 7.1 mm. inserted in O. D. by patient himself—used Butyn—no discomfort—used one drop adrenalin—no congestion—worn about 2 hours.

11/10/30.

Contact lens 7.1 mm. inserted by patient and 9 mm. in O. S., also by patient. Butyn used, no discomfort, wore lenses outdoors for three hours—easily removed by doctor. One drop of adrenalin used in each eye after Butyn.

11/16/30.

Patient inserted lenses—no drugs—worn comfortably for one hour then removed. No congestion.

11/19/30.

Patient inserted lenses. O. D. 9 mm., O. S. 7.1 mm. No drugs V. A. of O. D. with contact 20/100. Lenses worn for 3 hours. Lenses removed by doctor.

11/23/30.

Patient inserted lenses O. D. 9 mm., O. S. 7.1 mm. No drugs. Worn 3 hours at picture show—no discomfort. Lenses removed by patient—no difficulty.

11/30/30.

Patient wore lenses 4 hours. Easily inserted and removed. Patient to date has shown no unfavorable reaction. No drugs used.

12/7/30.

Patient wore lenses 4 hours. Has gained considerable facility in inserting them. Experiences no discomfort in using them. A lens of 8.00 mm. corneal radius combined with plano refraction and 11 mm. scleral curve was ordered.

Conclusion

1. The use of contact lenses as correction lenses produces marked changes in the dioptrics of the combined system of correction lens and eye. Properly selected they optically surpass ordinary spectacle lens corrections in certain special cases.

2. The patient's ability to handle these lenses successfully, *i.e.*, insert and remove them has been sufficiently demonstrated.

3. Tolerance on the part of the patient towards these lenses has been secured in actual cases. The best method of securing and maintaining tolerance is still in the experimental stage.

This work was carried on with the co-operation of Solomon S. Feinstein, M. D. His interest in the problem did much to help in the results to date. He was at all times in touch with the subjects and patients upon whom the lenses were used. In his capacity as physician, he made the diagnosis, prescribed the drugs, and outlined the medical treatment. His proven ability in medicine, his intimate knowledge of optometry and life long friendship with the writer made him an apt colleague in this work.

All the laborious work of computation was diligently done by Miss Ida Dubin, whom the writer graciously thanks.

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POSSIBLE CHARACTERISTICS OF MYOPIA

Dr. A. L. Cohen, optometrist of Portland, Maine, writing on myopia in the spring 1932 issue of the Ocularum, states that as a rule myopes will be found to possess what he terms prominent eyeballs. They will also, he claims, have a broad face, a wide interpupilary distance, a tendency towards a divergent squint and also in the majority of them a deeply pigmented iris.

Dr. Cohen's brief paper is well written and interesting but the portion referred to regarding the general characteristics of those having myopia arrested the writer's attention for two reasons. In the first place, he had heard these things said and also read them before and in the second place his own refractive experience by no means bore them out. While it is unquestionably true that certain individual myopes do show a slight apparent protrusion of the eyeballs at times coupled with a wide interpupilary distance, the writer's records fail, however, to show but a very few of these cases among a rather large number of myopes, whose records are at hand. It would be interesting for one of our universities or clinics to compile data on these possible diagnostic syndromes and establish once and for all, either the fallacy of this theory or else its soundness.

C. C. K.

BOOK NOTICES

THE OCULAR MUSCLES, L. A. Swann, published by the Hatton Press, Ltd., 72-78 Fleet Street, London E.C.4. 208 pages, illustrated. 15s 1931.

Dr. Swann has presented in this little text a complete review of the diagnostic and treatment technics of ocular muscular abnormalities. The book fully covers all of the common abnormalities as well as going into no little detail regarding the treating of the more uncommon neuromuscular complications. Written in England, the book naturally refers to many of the British treatment devices such as the Synoptophore, the Synoptiscope, the Crawford Myflexor and others, as well as mentioning the better known American instruments such as the Kratometer and Myoculator. Swann has gone to great pains to apparently bring this volume up to date in his usual conservative manner. There are no extravagant statements made and the entire subject is presented in a very pleasing way.

Whether the book is procurable in America or not we do not know but if it is not it should be, as much of interest has been presented by this well known British optometrist. C. C. K.

THE PRINCIPAL NERVOUS PATHWAYS, Andrew Theodore Rasmussen, Ph.D., Professor of Neurology, University, Minnesota. Published by The Macmillan Publishing Company, New York. 74 pages, 28 full page cuts and schemes. $2.50. January, 1932.

In this book "Principal Nervous Pathways," Professor Rasmussen has succeeded in presenting a very complete picture and an accurate account of the most important nervous pathways in the central nervous system and their relation to the peripheral nerves. This is the result of many years of original research work, of careful planning and a review of an extensive amount of an ever growing neurological literature. The author attempted to present here only the more important neurological units and carefully eliminated most of the details which are contained in most books on this subject.

Of special interest to the refractionists are the full page illustrations, number 11 illustrating Binocular Vision and Reflexes through Midbrain, number 12 Localization of Fibers from Retina to Visual Cortex and number 12 on Innervation of the Eye. From these illustrations one can learn with ease all that is known today about the intricate nervous connections of the eye and its appendages.

The author has so arranged the material and condensed the facts that the reader can by careful study grasp the important points of interest.

J. I. K.

ANNOTATIONS AND SOCIETY PROCEEDINGS

The American Journal of Optometry is the Official Organ of the American Academy of Optometry, as well as the Organ of the Arkansas, Delaware, Indiana, Iowa, Maine, Maryland, Michigan, Minnesota, Nebraska, North Dakota, Oklahoma, Pennsylvania, South Dakota, Vermont and West Virginia Optometric Associations.

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DR. L. P. FOLSOM
South Royalton, Vt.
DR. F. W. FREEMAN
Anderson, Ind.
DR. A. J. LARGE
Winona, Minn.

MINNESOTA ANNUAL CONVENTION

Dr. A. H. Nordland, Secretary of the Minnesota State Association of Optometrists announces that the Annual Convention of this society will be held at the St. Paul Hotel, April 3rd and 4th in St. Paul. Dr. Louis Jaques, Dr. J. C. Copeland and Dr. Carl Shephard will be the chief speakers at the Convention.

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LEHIGH VALLEY SOCIETY

Pennsylvania, on May first. The subject of high Valley Optometric Society at Allentown, Dr. Louis Jaques will appear before the Lehis lecture will be "Blur-Point Technic."

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ANTHRACITE OPTOMETRIC ASSOCIATION

Dr. Albert Fitch, President of the Pennsylvania State College of Optometry delivered a group of lectures on "Office Practice" before a large group of optometrists on Sunday, February 14th, at Berwick, Pennsylvania.

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NASSAU SOFFOLK SOCIETY

The organization of the Nassau-Soffolk Optometric Society took place at Garden City, Long Island, on January 24th. Dr. E. Dailey of Hempstead was elected President; Dr. M. H. Robinson of Patchoque, Vice President; Dr. Dorothy Weitzner of Point Washington, Secretary; and Dr. Wm. Kitchel of Hempstead, Treasurer.

MESSAGE FROM THE A. A. A. O.

In a former writing we indicated the unfairness of subjecting optometrists to an ever-rising educational standard without permitting them a commensurate increase in clinical service. The truth of the matter is made evident in the preponderance of mail received from the State of New York, where the heaviest educational requirements are imposed upon her practitioners. The expressions in favor of professional expansion coming from this State might be interpreted as the natural reaction of men of superior training. It is more likely, however, that these men better realize how disproportionate is the service permitted them to the training and preparation required of them.

New York State's requirement for the practice of Optometry today, is what for years had been considered an ample educational standard for the practice of medicine. It is a far cry from what the practice of medicine has entailed and rendered with distinction during these years, to the puny field of ocular-refraction permitted the optometrist today under an equal measure of preparation. It is very evident that the optometrist who must complete four years of High School work as a preliminary education and then devote four years more in a College or University in order to achieve a Bachelor's degree in the Arts or Sciences before he is permitted to practice Optometry, is badly imposed upon when restricted to the very meager field of refracting his patients.

The American Association for the Advancement of Optometry is not discouraging cultural growth and higher educational standards for optometrists. It would merely point out the unfairness of loading down practitioners with indifferent learning and deliberately steering shy of such training as will lead to an enlarged practical service. We have had enough of imaginary refinements in refractive procedure. Such efforts devoted to an expansion in service, would qualify the optometrist for something more than the fitting of spectacles. It would provide the necessary prestige and redound to his economic advantage.

It is idle to harp on the possibilities of expansion by way of pure refraction. To improve our work as refractionists is good and well. No one earnestly engaged in refractive work will fail to avail himself of advances that contribute to better refraction. But if we search our conscience we shall see that some of this effort toward intensive refinement of optometric work is reaching the point of absurdity. In the effort to appear progressive while clinging to traditional limitations we point with pride to such work as field testing. Field testing in optometry is a negative service at best. What if we do chart the field with punctilio. Does it have any part in the determination of refraction? Is it more than another meaningless test to the patient? Does it permit us to do more for the patient than to supply him a pair of glasses? The answer in each case is an emphatic, No.

Negative tests have, of course, certain values. But we can not build a profession on negative testing. When not a single opportunity is

afforded to repair the defect uncovered by such investigations, the tests become largely gestures. That is the kind of progress we are encouraged to make in the hope of furthering optometry's interests.

The strongest appeal in support of the present system is the alleged opportunities said to obtain in the field of orthoptic training. Here many insist is a genuine bulwark upon which the profession of optometry may well hope to build. The writer as many know, has pioneered the field of muscle work for many years. He does not waver in his enthusiasm for this work. He would make this observation, now, however. Orthoptic training offers a very limited field for the honest and conscientious optometrist. While those in need of this service run into substantial figures in the aggregate, the percentage of patients one meets in practice who are genuinely in need of this service is comparatively small. Those who would make capital of this work, are in danger of the fate of the quack and the charlatan. A certain editor who considers optometry as now practiced ample for all our needs, makes this allusion to orthoptic training while having in mind the fellow who administers muscle treatment without discrimination: "He" (the optometrist) "suggests 'Orthoptics.' He will work up a little suspected symptom into a grave peril, and have lenses to relieve every nervous symptom." It is precisely so.

If optometrists were permitted to do something worth-while besides refracting, there would be no need for stressing insignificant things in practice: no occasion to draw upon the imagination for fantastic theories and innovations. All the fads held by extremists would be thrown overboard, and we should have a pure, consistent and recognized profession. A better conscience would then prevail, and we should reflect the confidence, the courage and intelligence which is our true possession.

SAMUEL H. ROBINSON,
CHAIRMAN, A. A. A. O.
PRESCOTT, ARIZONA

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SOUTHWESTERN NEW YORK SOCIETY

Dr. C. K. Haynes was chief speaker before the Southwestern New York Optometric Society at its recent meeting at Salamanca, New York. His subject was "Spectacles—Legendary and Historical." Following his address the following officers were elected to serve the society for 1932: Dr. J. C. Powers, Westfield, New York, President; Dr. S. G. Engel, Salamanca, New York, Vice President; Dr. C. K. Haynes, Jamestown, New York, Treasurer; and Dr. Glenn R. Fish, Dunkirk, New York, Secretary.

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SKEFFINGTON IN MINNESOTA

Dr. A. M. Skeffington, Chairman of the Graduate Clinic Foundation conducted a three day clinic at the Nicollet Hotel in Minneapolis starting January 31st. Twenty-nine optometrists attended this clinic and were enthusiastic as to the results obtained.

The

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